BACHELOR OF TECHNOLOGY (C.B.C.S.) (2020 COURSE)
B.Tech.Sem - III CIVIL : WINTER- 2022
SUBJECT : MECHANICS OF SOLIDS

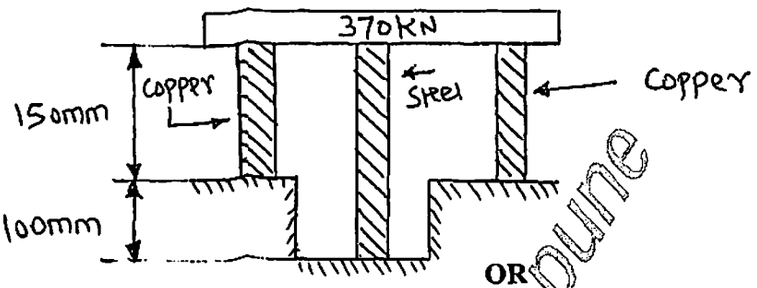
Day : Wednesday | Time : 10:00 AM-01:00 PM

Date : 07-12-2022 | **W-24362-2022** | Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Draw neat and labeled diagram **WHEREVER** necessary.
5) Assume suitable data if necessary.

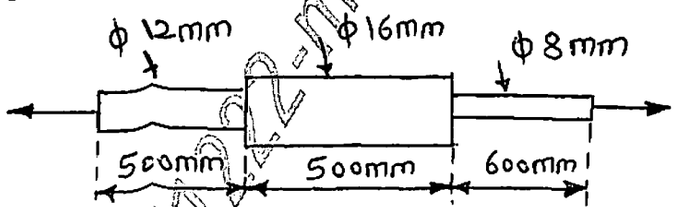
Q.1 A steel rod and two copper rods together supports a load of 370 KN as shown in figure. The cross sectional area of steel rod is 2500 mm^2 and of each copper rod is 1600 mm^2. Find the stresses in the rods. Take Young's modulus of steel E_{steel} = 200 GPa and for copper E_{copper} = 100 GPa. **[10]**



OR

Q.1 a) A load of 10 KN is to be raised with the help of steel cable. Calculate the minimum diameter of cable if stress is not exceed 100 N/mm^2. Take E = 200 GPa. **[03]**

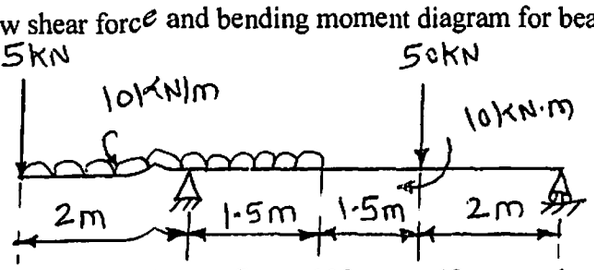
b) A steel bar shown in figure is subjected to a tensile load. Calculate the total elongation of the bar if E = 200 GPa and the maximum stress induced. **[07]**



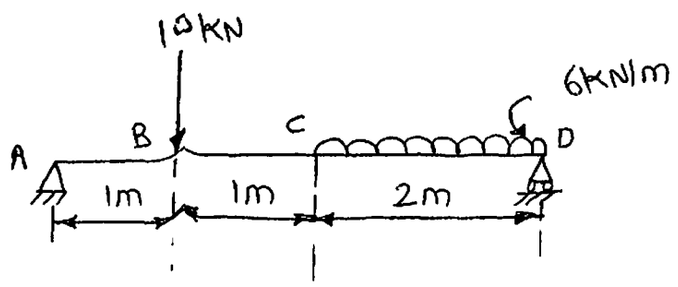
Q.2 A cantilever beam of span 4 m is subjected to a uniformly distributed load of 20 KN/m over a distance of 3m from free end and a point load of 10 KN is acting at the mid span of beam. Draw shear force and bending moment diagram. **[10]**

OR

Q.2 Draw shear force and bending moment diagram for beam shown in figure. **[10]**



Q.3 A 'T' beam having top flange 120 mm × 12 mm and web 12 mm × 150 mm is loaded as shown in figure. Using Macaulay's method. Calculate slope and deflection at point B and C. Take E = 200 GPa. **[10]**



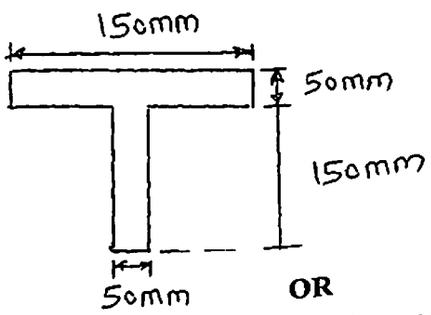
P.T.O.

OR

Q.3 **a)** A beam of rectangular section 'b × d' in size is simply supported of span 4 m carrying UDL of 20 KN/m over entire span. Determine the dimensions of the section if maximum bending stress is not to exceed 115 MPa. Take d = 1.5 b. **[06]**

b) State the assumptions made in theory of pure bending. **[04]**

Q.4 The cross section of a cast iron beam is a T section as shown in figure. The beam is simply supported over a span of 6m and carries a UDL of 80 KN/m over the entire span. Draw the shear stress distribution at the critical section. **[10]**



OR

Q.4 A solid shaft is to transmit power of 300 kW at 100 rpm. If the shear stress is not exceed 100 MPa. Find the diameter of the shaft. What percentage of saving in weight would be obtained if the shaft were replaced by a hollow shaft whose internal diameter is 0.7 times the external diameter? The length of material, maximum shear stress and torque being same. **[10]**

Q.5 **a)** State the end conditions of loaded column with their equivalent length. **[03]**

b) Compare the bulking loads of column having same cross sectional area. The shapes are: **[07]**

i) Hollow circular section with internal diameter 0.7 times the external diameter.

ii) Rectangular section with width equal to twice the depth.

OR

Q.5 **a)** Why the direct and bending stresses are produced due to eccentric loads? Explain with the help of an example. **[04]**

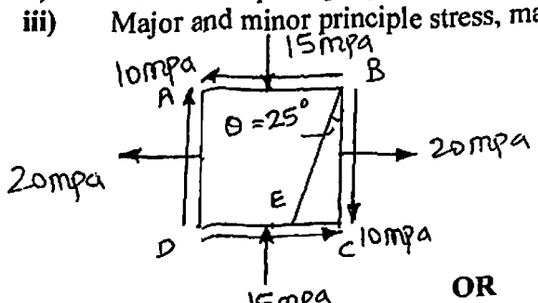
b) A cast iron column of 200 mm external diameter and 180 mm internal diameter is subjected to a compressive load of 100 KN. The load acts at 40mm from the axis. Determine the limiting values of stresses. **[06]**

Q.6 Define principal plane and principal stress. At a point in a strained material, stress pattern is shown in figure by using analytical method determine: **[10]**

i) Normal and tangential stress

ii) Location of principle plane

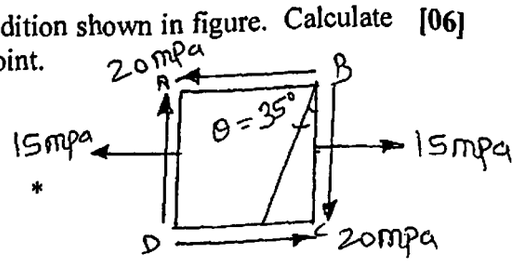
iii) Major and minor principle stress, maximum shear stress.



OR

Q.6 **a)** A solid shaft of 8mm diameter has to resists a bending moment of 50KN.m accompanied by torque 20KN.m. Calculate the maximum principal stress induced in the shaft **[04]**

b) Draw a Mohr's circle diagram for stress condition shown in figure. Calculate the major and minor principle stress at the point. **[06]**



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BACHELOR OF TECHNOLOGY (C.B.C.S.) (2020 COURSE)
B.Tech.Sem - IV CIVIL : WINTER- 2022
SUBJECT : ANALYSIS OF DETERMINATE STRUCTURES

Day : Tuesday | Time : 02:30 PM-05:30 PM

Date : 29-11-2022 | W-24374-2022 | Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**
2) Figures to the right indicate **FULL** marks.
3) **ASSUME** suitable data, if necessary.
4) Use of non-programmable calculator is **ALLOWED.**
5) Draw neat and labelled diagrams **WHEREVER** necessary.

Q.1 **A)** State clearly the advantages and disadvantages of indeterminate structures compared with determinate structures. **(04)**

B) Determine static and kinematic indeterminacy for the structure as shown in figure. **(06)**

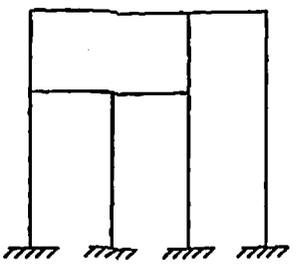


Fig. 1b(i) Rigid jointed Frame

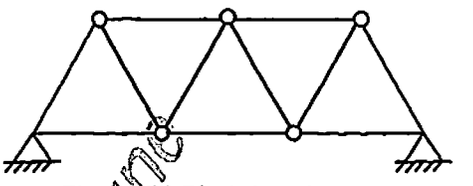


Fig. 1b(ii) Pin jointed Truss

OR

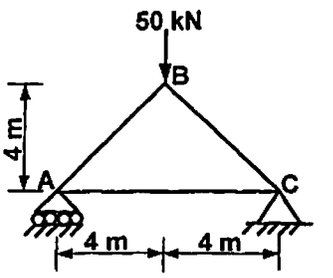
Q.1 **A)** Explain with neat sketches the types and classification of structures **(10)**

Q.2 **A)** A uniform rod of cross-sectional area A, length L is held vertically and fixed at the top and free at bottom. Derive the expression for the strain energy due to self-weight. Take, Modulus of Elasticity as E and rod density as ρ. **(06)**

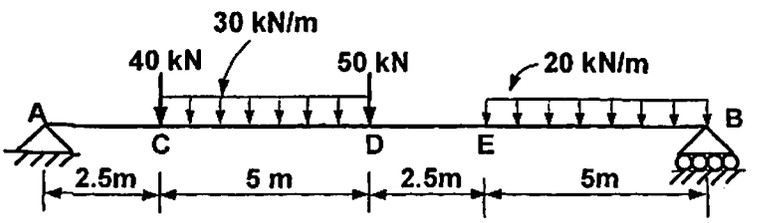
B) State and explain Castigliano's first theorem. **(04)**

OR

Q.2 Using Castigliano's first theorem, determine the vertical deflection of joint B of the pin jointed truss as shown in figure. The area of each member is 100 mm^2. Take E = 210 GPa. **(10)**



Q.3 Calculate the reactions R_A & R_B. Also, calculate shear force and bending moment at point D, using Influence Line Diagram. **(10)**



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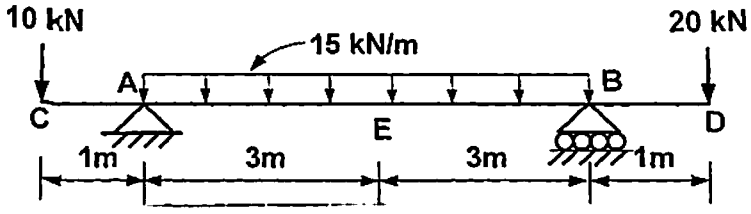
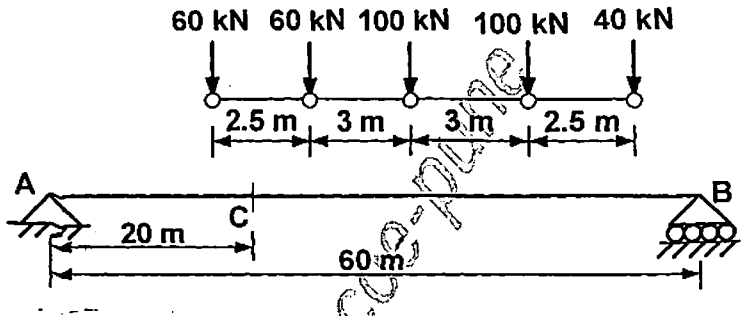
OR

Q.3 Calculate the reactions R_A & R_B. Also, calculate shear force and bending moment at point E, using Influence Line Diagram. **(10)**

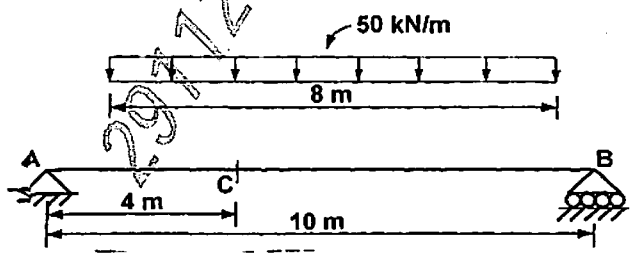


Q.4 The system of point loads as shown in figure rolls from left to right across a beam simply supported over a span of 60 m, the 40 kN load is leading. For the point at 20 m from the left hand support, determine the maximum bending moment using Influence Line Diagram. **(10)**

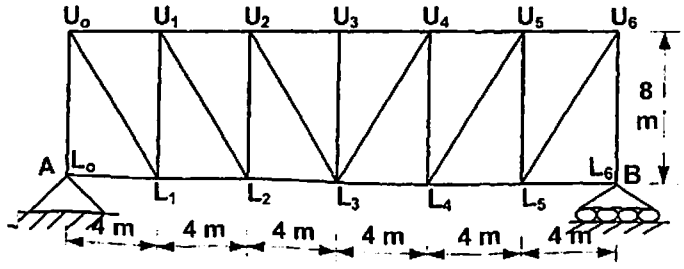


OR

Q.4 A live load of 50 kN/m, 8 m long moves on a simply supported beam of 10 m. using Influence Line Diagram calculate the maximum bending moment at 4 m from the left end for the beam as shown in figure. **(10)**



Q.5 Draw Influence Line Diagram for U_1U_2, U_1L_2, and L_1L_2 for the truss as shown in figure. **(10)**



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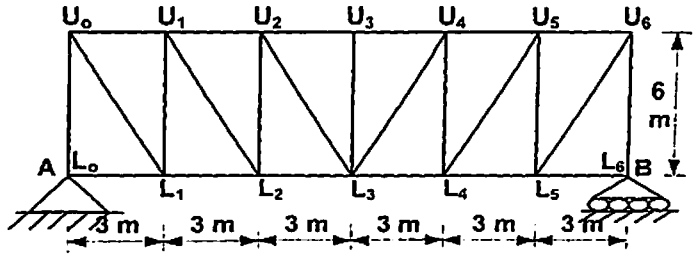
OR

Q.5 Draw Influence Line Diagram for U_3U_4, U_4L_3, and L_3L_4 for the truss as shown in figure. **(10)**



Q.6 A three hinged parabolic arch of span 20 m, rise 4 m is subjected to uniformly distributed load of 30 kN/m over the left half span and a point load of 40 kN at 6 m from the right support. Find the reaction at the supports. Also, find the bending moment, radial shear and normal thrust at 3 m from the left support. **(10)**

OR

Q.6 A three hinged parabolic arch of span 20 m and central rise of 5 m is subjected to two point loads of 160 kN and 140 kN at left and right quarter span points respectively. Find the reaction at the supports. Also, find the bending moment, radial shear and normal thrust at 6 m from the left support. **(10)**

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